11:45

786-6 Low Temperature (T) Mapping Predicts Site of Successful Ablation While Minimizing Myocardial Damage

J. Marc Cote, Michael R. Epstein, John K. Triedman, Edward P. Walsh, J. Philip Saul. *Children's Hospital, Boston, MA*

Radiofrequency (RF) energy can produce reversible conduction block at tissue T's from 45–50ºC. This study tests the hypothesis that low T RF applications using closed-loop T monitoring (Atakr, Medtronics) can improve accessory pathway (AP) mapping accuracy while minimizing myocardial necrosis. In 15 patients (5–34 yrs) with single AP's, RF energy was initially applied as a *test* at a setpoint of 50º for 10 sec or until AP conduction block. At successful sites, a 30–60 sec RF application with a 70º setpoint was delivered at the same site. For some unsuccessful sites, 50º *tests* were followed by a higher T, 10 sec *test* (60º or 70º) to determine if inefficacy was due to inadequate heating or improper catheter positioning. A total of 27–50º, 7–60º, and 16–70º RF applications were delivered to 15 successful and 12 unsuccessful sites. At 14/15 successful sites, the initial 50º *test* resulted in AP block (positive predictive value — 93%) at 2.4 sec (1–7 sec) with a peak T of 47º (44–49º). Conduction returned in 13 of the 14 AP's, 3.1 sec (0.7–7 sec) after turning off RF power. One 50º test lesion achieved permanent block, while for the other 14 AP's, the subsequent 70º application achieved permanent block at 1.2 sec (0.7–2.1 sec) with mean and peak T's of 56 and 61º. At 11/12 unsuccessful sites, neither the low T *test* (peak T 47º, range 44–50º) nor a higher T *test* in 6, (peak T 54º, range 49–62º) resulted in AP block, while at the other unsuccessful site both 50º (10 sec) and 70º (60 sec) applications produced transient block only, suggesting that at unsuccessful sites, catheter position more than T was responsible for absence of AP block.

The data indicate that low T RF *tests* can predict the site of permanently successful AP ablation ($p = 0.0013$). Further, rapid return of conduction with most low T lesions suggests reversible myocardial injury. Thus, low T *tests* appear to be a useful AP mapping tool.

787 Advances in Contrast Echocardiography and Doppler Tissue Imaging

Wednesday, March 27, 1996, 10:30 a.m.–Noon
Orange County Convention Center, Room 230C

10:30

787-1 Albumin Microbubbles Preferentially Adhere to the Extracellular Matrix of Inflamed Human Coronary Endothelium

Ron J. Jankowski, William R. Wagner, Peter Alibali, Rina Ghandi, Flordeliza S. Villanueva. *University of Pittsburgh, Pittsburgh, PA*

Although under normal conditions, sonicated albumin microbubbles (Albunex®) pass unimpeded through the microcirculation, during some physiologic states such as following cardioplegia delivery, microbubbles linger in the myocardium despite constant flow. To determine potential mechanisms of microbubble persistence, Albunex®-endothelial cell interactions were microscopically studied utilizing a perfused cell culture preparation with and without prior inflammatory injury. Coverslips with cultured human coronary artery endothelial cells (HCAECs) were mounted in a perfusion system and perfused for 3.5 min with a 1:10 dilution of fluorescein-labeled Albunex® microbubbles (50,000 bubbles/ul) in cell culture medium at a shear rate of 100 sec^{-1}. To create inflammatory HCAECs, 20 ng/ml of phorbol myristate acetate was added to the culture medium 5 hrs prior to perfusion. The number of adherent bubbles was quantified in 8–14 microscopic fields (at 1000×) following perfusion using an epifluorescent microscope.

For both inflammatory and control conditions, bubbles adhered exclusively to exposed extracellular matrix, whereas cell surfaces and regions with confluent cells were entirely bubble-free. Significantly fewer bubbles attached to the control matrix vs. inflammatory matrix (502 ± 487 vs. 3047 ± 2915 bubbles/mm^2 exposed matrix, $p < 0.004$). A linear relationship existed between the spatial extent of exposed inflammatory matrix and number of adherent bubbles ($r = 0.87$). Based on these observations, we conclude that denuded endothelium, and not endothelial cells per se, provides a site for bubble adhesion, and that inflammation enhances adherence. These data suggest that myocardial contrast echocardiography (MCE) can be used to assess endothelial dysfunction or damage, and may have implications for MCE measurements of blood flow using microbubble transit rates.

10:45

787-2 In Vivo Targeting of Echogenic Liposomes for Tissue Specific Ultrasonic Enhancement

Sasha E. Murer, Bonnie J. Kane, Michael J. Vonesh, Melvin E. Klegerman, Jeremy L. Gilbert, Sanford I. Roth, Hayat Alkan-Onyuksel, David D. McPherson. *Northwestern University Medical School, Chicago, Illinois; University of Illinois College of Pharmacy, Chicago, Illinois*

Tissue specific ultrasonic enhancement can be used for the detection and characterization of atherosclerosis (ATH). We have demonstrated the generation of inherently echogenic liposomes solely by varying lipid composition and that acoustically reflective properties can be retained in vitro following antibody conjugation. To evaluate in vivo enhancement, we utilized an ATH Yucatan miniswine model ($n = 4$). Liposomes were prepared using a (60:8:2:30) molar mixture of phosphatidylcholine, 4-(p-malemidophenyl) butryl phosphatidylethanolamine, phosphatidylglycerol, and cholesterol by a dehydration-rehydration method. Rabbit anti-human N-succinimidyl 3-(2-pyridyldithio) propionate (SPDP) fibrinogen was thiolated for conjugation. Following liposomal reaction, the unbound protein was removed. Unconjugated liposomes, then antibody conjugated liposomes were injected into the atheroma induced and normal arteries and imaged with a 20 mHz intravascular ultrasound catheter (Boston Scientific, Sunnyvale, CA). The in vivo echogenicity of the liposomes were compared to that of blood components.

Results:

Gray Scale	Blood	Unconjugated Liposomes	Conjugated Liposomes
Mean	37	103*	112*
SD	13.2	6.73	9.78

*$p < 0.05$ vs Blood

ATH tissue targeting was demonstrated with the conjugated liposomes. We have demonstrated that these novel liposomes retain their acoustic properties in vivo with site specific ATH enhancement.

11:00

787-3 Visualization of Intramyocardial Coronary Vessels by Contrast Echocardiography; Observations Using AFO146 (Imagent) During Second Harmonic Imaging

Bruno Cotter, Anh Duong, Oi Ling Kwan, Karen Wheeler, Shiro Nozaki, Anthony DeMaria. *Univ of California at San Diego, CA*

Previous studies using ultrasonic contrast agents have yielded a uniform myocardial blush attributed to the coronary microcirculation. AFO 146 is a new contrast agent which results in linear or punctate opacification of the myocardium indicative of vascular structures. To further examine this phenomenon, we studied 5 closed chest anesthetized dogs in whom we injected incremental doses (0.5, 1.0, and 1.5 cc) of AFO 146. Injections of 0.06 cc/Kg were then given after IV dipyridamole infusion (0.57 cc/Kg) and LAD ligation. Second harmonic imaging (2H) (2.5 MHz transmitting, 5.0 MHz receiving) was performed in SAX view at mid papillary level using a prototype scanner (Acuson). EKG, LV, FA and PA pressures were monitored; PO2 and cardiac output were performed at baseline and 3 min post injection. Videointensity in gray levels (GL) was obtained from the midseptum. During injection of AFO146 at all doses. 2H imaging, but not fundamental, produced discrete punctate or linear densities which persisted from 15 to 60 sec, appeared to branch, and from which Doppler recordings demonstrating diastolic flow velocities could usually be recorded. At doses of 1.5 cc, appearance of "vascular" structures was preceded by a short (19 ± 14 sec) generalized myocardial blush. Increases in videointensity after AFO146 were recorded at 1.5 cc dose:baseline, 8 ± 2 to 20 ± 9 GL; after dipyridamole, 9 ± 4 to 27 ± 7 GL; and paradoxically, after LAD occlusion, 9 ± 2 to 33 ± 18 GL, all $p < 0.02$. Doppler recordings of some "vascular" structures post LAD occlusion revealed myocardial to epicardial flow suggestive of coronary collaterals. No hemodynamic changes were observed during any injection. Thus, second harmonic imaging with AFO146 produces a characteristic image consistent with intramyocardial vascular structures. Understanding of this phenomenon may provide the basis for the direct assessment of coronary flow and vessels in pts.

11:15

787-4 Improved Myocardial Echocardiographic Contrast With Second Harmonic Transient Response Imaging in Humans Using Intravenous Perfluorocarbon-Exposed Sonicated Dextrose Albumin

Thomas Porter, Feng Xie, Robert Armbruster, David Kricsfeld. *University of Nebraska Medical Center; Omaha, Nebraska*

We have shown in animals that very low doses of intravenous (IV) perfluoro-